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gers a relapse to text book methods, and neglect of the first hand study of the facts. Is it too much to expect of teachers who emphasize the value of these subjects that they should guide the students in the gathering, correlating and interpreting of biological data by definite and practical methods that will insure the least waste of time and energy? Shall we never get rid of the spectacle of a teacher and a score of students trying to peer at once into the same worm hole? Shall we be forever content with merely *demonstrating* biological phenomena?

J. G. N.

Two Papers on Insect Wings.¹—A remarkable American silkworm moth (*Telea polyphemus*) with its right wings deviating from the normal in both color pattern and venation, furnishes to Dr. G. Enderlein a theme for the discussion of ontogenetic processes. The important part of the paper is that embodying the results of a search for ontogenetic processes in the light of which the aberration might be explained. These remarks from the introduction are interesting and set forth the author's point of view: "Experimental investigations serve only as a means of varying ontogenetic processes and also, therefore, of influencing, hindering or varying the combined sum of inner mechanical forces by means of the outer mechanical forces, in order to advance a little by means of the knowledge of their reaction to these forces. By such means no new forms will be brought to light; for no noteworthy, sudden result can be induced in phylogeny by the operation of external influences: phylogeny is but the slowly progressing result of summarization; so we would have to expect only phylogenetic forms which still exist somewhere in ontogeny. Retarded developments (*Hemmungsbildungen*), which we may designate as reversions, are of equivalent value, whether we think of the anlage in the egg or of a later outcome of ontogenetic processes. But it should not be understood that all reversions have existed as actual species, for there may be manifold combinations of phylogenetically younger and older component factors."

So the author sets about a very careful investigation of the structure of Saturnian and other Lepidopterous pupæ. Incidentally he makes some contributions to the knowledge of the nervous system

¹ Enderlein, G. Eine einseitige Hemmungsbildung bei *Telea polyphemus* vom ontogenetischen Standpunkt: ein Beitrag zur Kenntniss der Entwicklung der Schmetterlinge. *Zool. Jahrb.*, Abt. für Anat. u. Ontogenie der Thiere. Vol. 16, 1902, pp. 44: 3 pls.

and digestive and reproductive organs, but his main purpose and his best results are in the study of the pupal tracheal system, and in the relation of the same to the venation of the adult wing. Most of his conclusions are abundantly evidenced, though some of them are not entirely new: but one of them at least — his two systems of tracheæ and veins, radial and median — is of very doubtful value: it rests on altogether insufficient evidence. Lepidoptera alone with their single pair of longitudinal tracheæ trunks, are too highly specialized to show what was the primitive manner of grouping. In the light of facts presented by other more generalized orders — facts that are set forth in a paper that the author repeatedly cites¹ — such grouping seems little less arbitrary than that of Spuler (into “spreitentheil” and “faltentheil”) which Dr. Enderlein justly condemns.

He finds in the end that his aberrant moth represents in the configuration of its venation from the ontogenetic point of view a pupal stage preserved in adult life: from the phylogenetic point of view, a one-sided reversion to a phylogenetically earlier stage, that is now normal to no living Saturnian moth.

The second and more recent paper is by Tower,² who makes a large and timely contribution to the knowledge of the development of the wings in Coleoptera. He calls attention to the great diversity of larval form and habitat and habits, and tabulates the differences in number of larval stages, length of larval life and time of first appearance of larval wings, and then discusses in detail the three types of early wing formation he finds in the order. His “simple type,” which he finds to be “the dominant type of wing development in beetles” is most interesting, because it bridges the gap in type of wing development between the holo- and the hetero-metabola. During the last larval stage the wing is directly evaginated downward underneath the cuticle and is merely uncovered by the last moult. His “recessed type” in which the wing rudiment withdraws slightly from the surface to the bottom of a hypodermal pocket, as in *Corethra*, and his “enclosed type,” in which the wing withdraws and is shut in by the closure of the pocket, as in *Lepidoptera* generally, are in beetles much less common.

He concludes that “the wings and spiracles arise in homologous

¹ Comstock and Needham, The wings of Insects. *Amer. Nat.*, vols. 32 and 33, 124 pp.

² Tower, W. L. The origin and development of the wings in Coleoptera. *Zool. Jahrb. Abt. für. Anat. u. Ontogeny der Thiere*. Vol. 17, 1903, pp. 516–572, Pls. 14–20.

positions on the sides of the segments, as determined by the position of homodynamous muscles, and that the hind wings are derived without much doubt from the degenerate spiracle disc of the metathorax": and adds, "All the evidence here presented concerning the wings of Coleoptera and Heterometabola is most positively opposed to the theory of the origin of the wings of insects as dorsal backward prolongations of the tergum."

There is little new ground broken in this paper, but there is much more careful tillage of a hitherto indifferently cultivated field.

J. G. N.

BOTANY.

A New Flora of the Southeastern United States.¹—A new handbook of the flora of this region has long been a desideratum, the data concerning the southern states being confined to antiquated books, the latest of which, Chapman's *Flora*, is a decade old, and to scattered descriptions, collector's notes, and isolated specimens, chiefly in the larger herbaria,—apart from one of which they could hardly have been brought together satisfactorily. Dr. Small, who is curator of the museums and herbarium of the New York Botanical Garden, and who has personally made extensive trips over a considerable part of the territory covered by the new Flora, consulting Elliott's herbarium at Charleston and the original Chapman herbarium at the New York Garden, is in an unequalled position to undertake the preparation of such a handbook, and though his own experience in the several years during which it has been going through the press shows the rapidity with which such works call for change when once launched, he has succeeded in placing before the public a manual which, if of awkward form and size for field use, is indispensable to every herbarium and botanical library in which the North American flora receives attention.

¹ Small, J. K., *Flora of the Southeastern United States being descriptions of the Seed-plants, ferns, and fern-allies growing naturally in North Carolina, South Carolina, Georgia, Florida, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, and the Indian Territory and in Oklahoma and Texas east of the One hundredth meridian*. New York, published by the author, 1903. 8vo, xii + 1370 pp.